

UPPER OLIGOCENE PALUSTRINE DEPOSITS IN THE "DEPRESION INTERMEDIA" BASIN (PROVS. OF CUENCA AND GUADALAJARA, CENTRAL SPAIN): BOREHOLE CORES INTERPRETATION.

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Resumen

En este trabajo se analizan las características sedimentológicas de los materiales palustres yesíferos y carbonatados que fueron cortados en sondeos de investigación de Uranio realizados en la Depresión Intermedia por la Empresa Nacional del Uranio S.A. (ENUSA). Se han podido determinar y datar tres secuencias menores, que no afloran, y precisar el tránsito Paleógeno- Neógeno en la cuenca.

Palabras clave: Palustre, abanico aluvial, Oligoceno superior, Depresión Intermedia, España.

Introduccion

The "Depresión Intermedia" Basin, is a 10.000 sq. kilometers long but narrow basin, between the Iberian Range and the Madrid Basin, Fig.-1.

Seismic profiles revealed a flat bottom interrupted by anticlines of S-N axes, with their west flank affected by dipping eastward reversed faults, cf. Querol (1989).

At the "Depresión Intermedia" Basin there are abundant outcrops of late Cretaceous-Upper Miocene deposits that allow to determine their stratigraphy and sedimentology, but lacustrine deposits of Oligocene age rarely outcrop and up to now never have been fully understood.

From 1977 to 1985 the basin have been fully explored for Uranium research purposes, and a first basin analysis was made, cf. Enusa (1984). By that time the basin was intensively drilled, with continuous core recovery drilling system and a first underground-surface geological interpretation was made, cf. Torres & Zapata (1986 a,b).

A large amount of core samples were picked out, washed and studied for microfacies determinations, appearing some micromammal teeth that finally were determined in 1991, López y Torres (1992). Paleontological data, revealed that the whole palustrine deposits intersected by boreholes were of Oligocene age, being possible to correlate them with carbonated deposits outcropping at the eastern flank of Córcoles Anticline, as it has been made by Diaz de Neira (in press), enlarging grandly the supposed area covered by such chemical deposits in Torres & Zapata (op.cit.).

Stratigraphical frame of the "Depresión Intermedia" Basin.

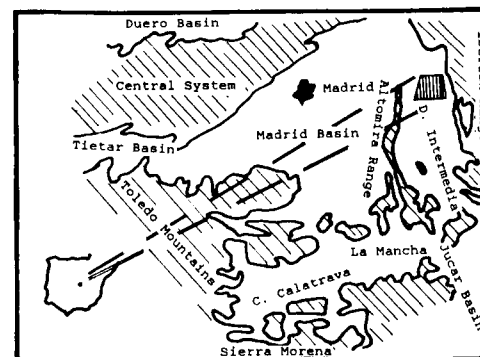
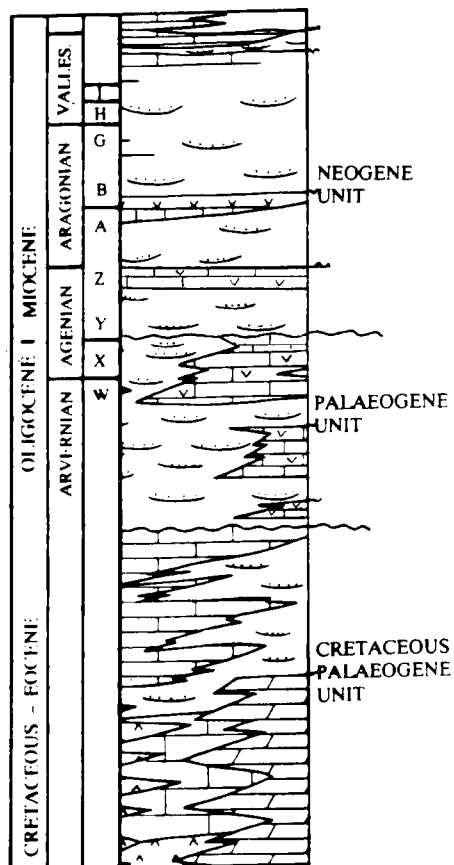


Fig.-1. General situation of the "Depresión Intermedia" Basin, and the study area.

Fig. 2.- Stratigraphy of the "Depresión Intermedia" Basin. After Junco & Torres (modified).

At the "Depresión Intermedia" Basin, two Paleogene and one Neogene units have been determined, Junco & Torres (in press), Fig.-2, having their correlates at the Madrid Basin: Cretaceous-Palaeogene Unit, Palaeogene Unit and Neogene Unit.

The former one was of Upper Cretaceous-Middle Oligocene age and includes the "Margas arcillas y yesos de Villalba de la Sierra Fm.", Melendez & Ramirez del Pozo (1972), and the "Unidad Detritica Inferior" (pro parte) de Díaz Molina (1978). This unit appears in conformity (regional unconformity?) on Upper Cretaceous marine rocks.

The Palaeogene Unit is equivalent pro parte to the "Unidad Detritica Superior" of Díaz Molina (op.cit.) and to the Second Palaeogene Cycle of Torres & Zapata (op.cit.), appearing in erosive unconformity on older deposits. This unconformity corresponds with the Intra-Arvernian deformation phase, and their lacustrine deposits will be the main objective of this paper.

The Neogene Unit lies on angular and erosive unconformity on older units. Their deposition started when a general alteration of the prior depositional conditions (Palaeogene) took place and the basin evolved from exorreic to endorreic behaviour. This palaeodrainage alteration was related with an alpine compressive phase of Intra-Agenian Age deformation.

In the Neogene Unit four Cycles, sedimentary sequences, have been determined and all of them are marked by alluvial systems grading distally and topwards to palustrine gypsiferous- carbonated deposits.

Palaeogeographical schedule of the "Depresión Intermedia" Basin.

The prevailing palaeogeographical conditions which controlled the Upper Cretaceous-Palaeogene platform changed suddenly with the Intra-Arvernian (alpine) compressive tectonic phase: areas of strong subsidence contrast were developed and new drainage patterns appeared, remaining until today, the Júcar river exception.

At the time of Paleogene Unit deposition the "Depresion Intermedia" Basin palaeogeographical conditions could be described as an **alluvial fan dominated** basin that is: the basin was mainly occupied by a very important humid alluvial fan system, Fig.-3, which apex was to the south of Cuenca city. There were some other minor humid alluvial fans and arid alluvial fans too. Humid alluvial fans had spread hydrological reception basin in the Iberian Range inner, which supplied hydrological inertia to fan systems while arid alluvial fans had only punctual hidrological reception basins, cf. Torres & Zapata (op.cit.).

The fact of being an alluvial fan dominated basin was also interconnected with the basin geometry: the basin was very narrow and channeled deposits alluvial fan related reached easily palustrine deposition areas during high flow periods: the basin of sedimentation never reached full centripetal deposition control and frequently

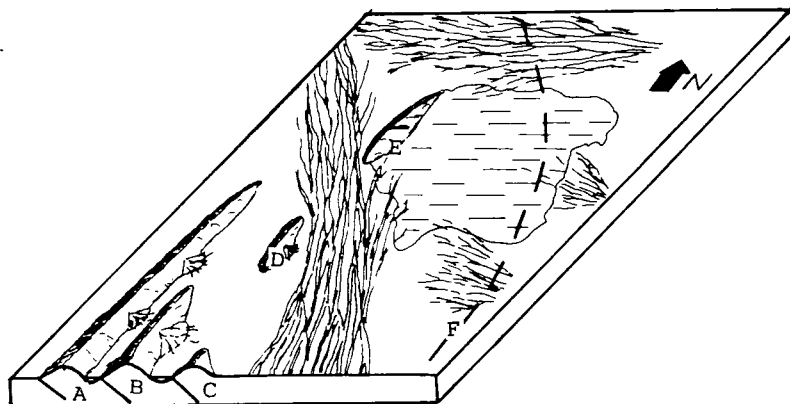


Fig.-3. Block diagram with the "Depresión Intermedia" Basin funcionement during the Palaeogene Unit. A-Altomira Range, B&C minor inner-basin anticlines. D-Carrascosa Anticline with Cerro Arenoso (palaeontological site) arid alluvial fan. E-Córcoles Anticline. F-Today position of the Iberian Range front. 1- main alluvial fan; 2-accessory humid alluvial fans; palustrine deposition area. From Enusa(modified).

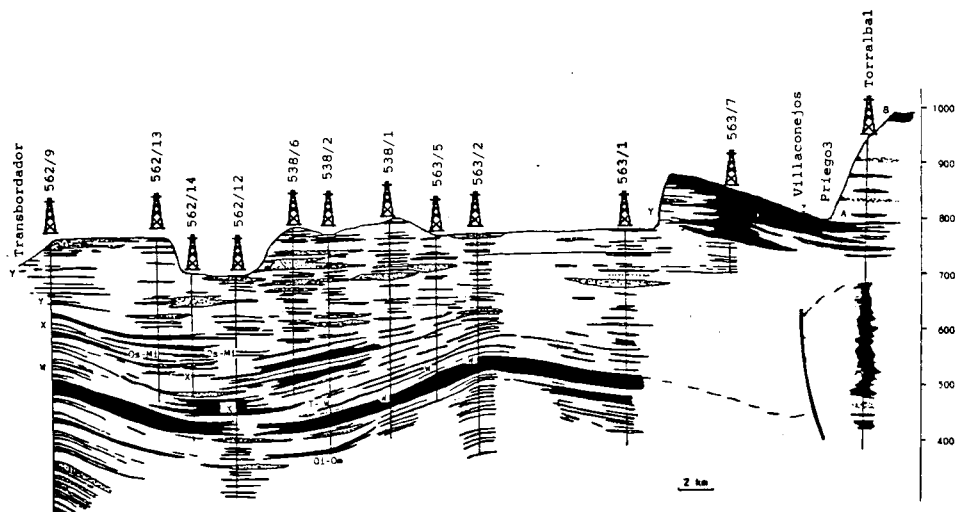


Fig.-4. General correlation of chemical deposits from drill hole core data. Oi-Om: lower-middle Oligocene; Mi: lower Miocene; W,X,Y,Z & B micromammal biozones of Daams & Freudenthal, Daams & Van der Meulen and Alvarez *et al.*. Geographical situation of drill holes and palaeontological localities is in Fig.-5. This correlation is partially figured in López & Torres (*op.cit.*)

worked as flood basin. Enusa (op. cit.).

The only exception to those alluvial fan dominated basin characteristics was near their NE corner where Córcoles Anticline produced a shadow energy area where an important chemical deposition was produced marking three minor sedimentary cycles and the top of Palaeogene Unit. Those deposits were tentatively interpreted (pro parte) as Neogene aged in Torres & Zapata (op. cit.) but general considerations about distinctive local behaviour of an alluvial fan dominated basin have full validity.

After the regional correlation of Fig.-4, it is possible to observe that they are, at least, three distinguishable chemical deposits horizons which are gently folded (note vertical scale exaggeration), the top of the unit is a sedimentary break marked by conspicuous presence of channeled deposits of the Neogene Unit. It is possible to observe too that Paleogene Unit chemical deposits (black) reached the eastern basin edge, locally passive at that moment, as it is possible to deduce from Torralbal old drill hole log, being strongly faulted (to the W) and overthrust (to the E).

The end of the Oligocene sequence took place in the Y biozone of Alvarez et al. (1987) when a general change of landscape was produced: the main humid alluvial fan system was aborted and their channel covered area uplifted, suffering further erosion. Minor humid alluvial fans generally remained active. During the Neogene cycle deposition other palustrine deposits appeared in the basin. In the Fig.-2 appear two of the best represented in the basin, whose deposition corresponded with the Z (Daams & Freudenthal op. cit.) and B (Daams & Van der Meulen op. cit.) biozones.

The Oligocene chemical sequence

In the Fig.-5 are represented in a fence correlation diagram the three main horizons of chemical deposits determined through Fig.-4 in an approximative N-S arrangement. Overlying detrital (channeled) deposits have been omitted.

The three chemical sequences are distinguished by the presence of detrital beds at their tops, marking local fining upward sedimentary sequences. Micropaleontological data contained in López & Torres (op. cit.) permitted to date all those sequences, borehole logs without paleontological data have been geometrically correlated taking into account structural configuration of the basin from seismic profiles interpretation.

The Lower sequence is not very well known because it has been intersected only by three boreholes: 538/2, 562/9 and 537/16. The former one was in a lowland zone and the other ones in the eastern flank of Córcoles Anticline. In the 538/2 borehole core it had an exclusive carbonated character, Fig.-6: micritic and argillaceous limestones with very abundant nodulae and secondary gypsum (megacrystals). In the other two boreholes (562/9 and 537/16) it has a gypsiferous character: massive (microlenticular) bioturbated gypsum with some scarce carbonated intercalations. At the "Depresión

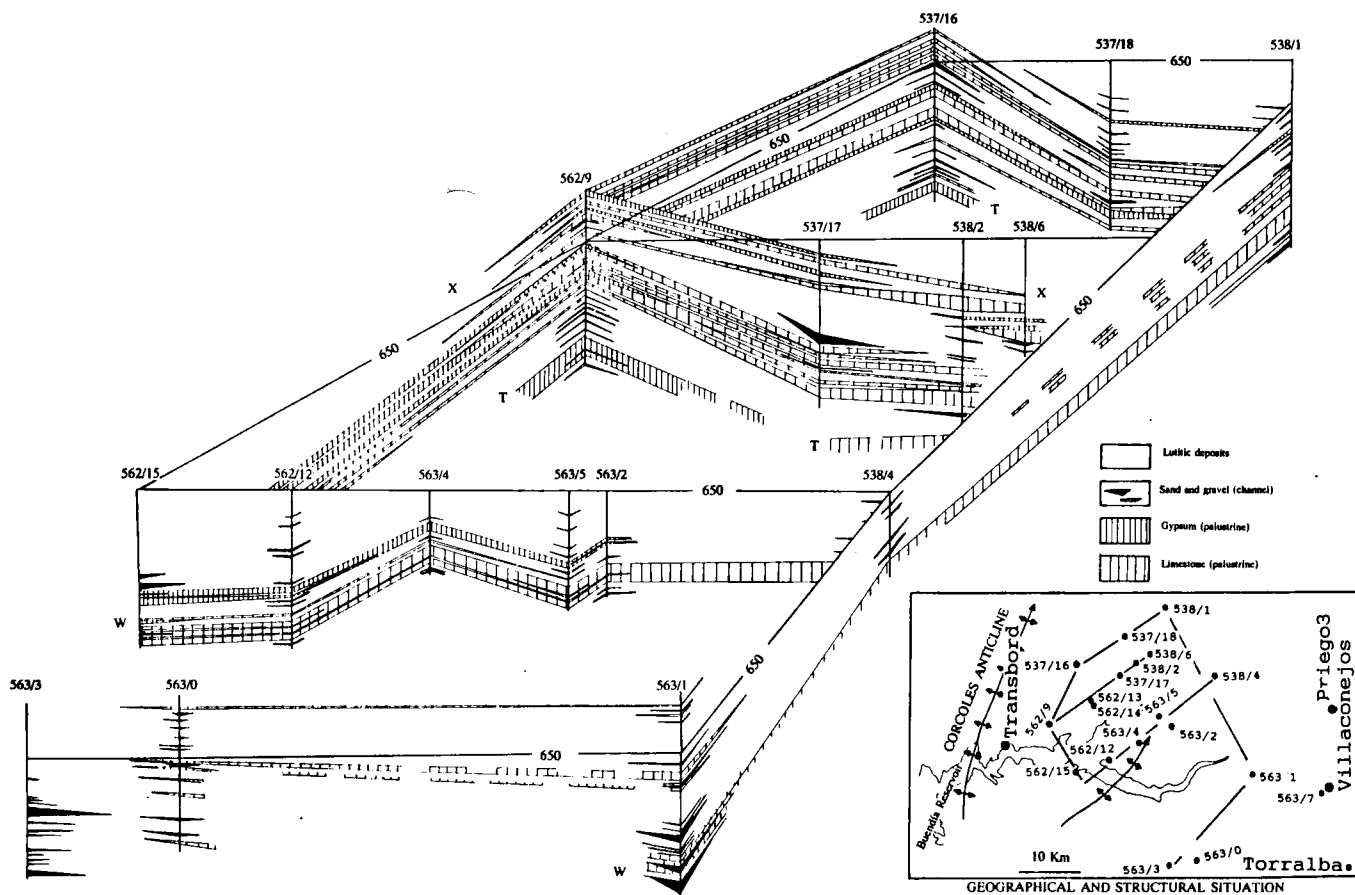


Fig.-5. Fence diagram correlation of three palustrine sequences of the Palaeogene Unit of the "Depresión Intermedia" Basin. Only chemical deposits of the borehole lithologs have been represented. T-Lower sequence, W-Middle sequence, X- Upper sequence.

Intermedia" Basin a very common event is the development of sudden facies changes between carbonates and gypsum, this fact can be explained through the development of a palustrine facies mosaic. Bioturbated microlenticular gypsum deposits have been interpreted of palustrine origin and not of sabkha environment, Torres & Zapata (op.cit.) because the presence of thick beds of end Cretaceous anhydrites (Liassic as well) which were dissolved and re-deposited during Oligocene and Miocene times in a "humid alluvial fan" dominated environment, as it has been definitely demonstrated by Ortí et al. (1988). The Lower sequence has been estimated of middle Oligocene (T?) age, but could reach the V biozone too. This is a problematic data because the bottom of the Paleogene Unit has been dated into the W biozone (Cerro Arenoso Fauna) but due to the onlapping character of this unit, we can tentatively assume that in active subsident areas near the east limit of the basin (area of chemical deposition) the sedimentation started before than in more passive zones near the western limit of the "Depression Intermedia" Basin (Cerro Arenoso). We do not know anything about this unit evolution southwards, but certainly changes into channeled deposits because chemical deposits never have been found in drill hole cores at the south of this point in spite of datation suggests strongly the existence of detrital deposits of this age.

The Middle sequence is very well known because it has been intercepted by the majority of boreholes. In spite of some lutitic, or sandy even, intercalations usually begins with thick carbonated deposits which digitate east and topwards changing into bioturbated gypsum in the Corcoles Anticline vicinity, it is very regular in thickness (a bit greater than 50m), Fig.-5. In detail it appears as a very complex system of chemical-lutitic alternances, channeled intercalations not been rare, Fig.-6. Chemicals are of gypsiferous (bioturbated organic matter rich microlenticular gypsum) or carbonated (micritic and argillaceous limestones) being common in the latter nodules, ocherosity and secondary gypsum megacrystals. Lutitic terms have carbonated and/or gypsiferous cements and when they show reduced colors (black-grey) are very rich in organic matter and contain plants debris, pyrite, Chara oogonia, bony remains, Crocodilia and Batracia teeth, pharyngean teeth of fishes (Cyprinidae) etc. Stromatolithic deposits are frequent: oncolithes in a organic rich matrix embedded, laminae or plant stems linked. Frequently they are strongly bioturbated and ripple cross bedding is not easily preserved. Carbonated nodulae (caliches perhaps), pseudogleys and secondary gypsum megacrystals suggest frequent vadose fluid movement. This sequence has a sure W biozone datation. South and eastwards they disappeared too being replaced by channeled (humid alluvial fan) deposits: 563/3, 563/0 boreholes.

The Upper sequence appears only in Corcoles Anticline vicinity: 562/9, 537/16, 537/1, 538/2 and 538/6 boreholes. It is not as well defined as the second one because chemical deposits bodies are thinner and less continuous. It is mostly carbonated at their beginning, becoming gypsiferous at the top of the sequence. Gypsum is microlenticular, usually bioturbated rarely nodular, limestones usually have high lutitic contents and are ocherous. Near the southern part of the area it shows disperse fine-v. fine sand.

Lutitic intercalations usually have large amounts of secondary gypsum (megacrystals), and carbonated nodules, usually they are bioturbated, but in some cases, it is possible to observe ripple cross bedding, fossil contents quite similar to the second sequence lutites. There are very frequent sandy intercalations, channel deposits, usually with trough and ripple cross bedding, fining upwards is common as well as bioturbation and soft pebble lags. Sands usually have reduced colors, as well as the Lower and Middle

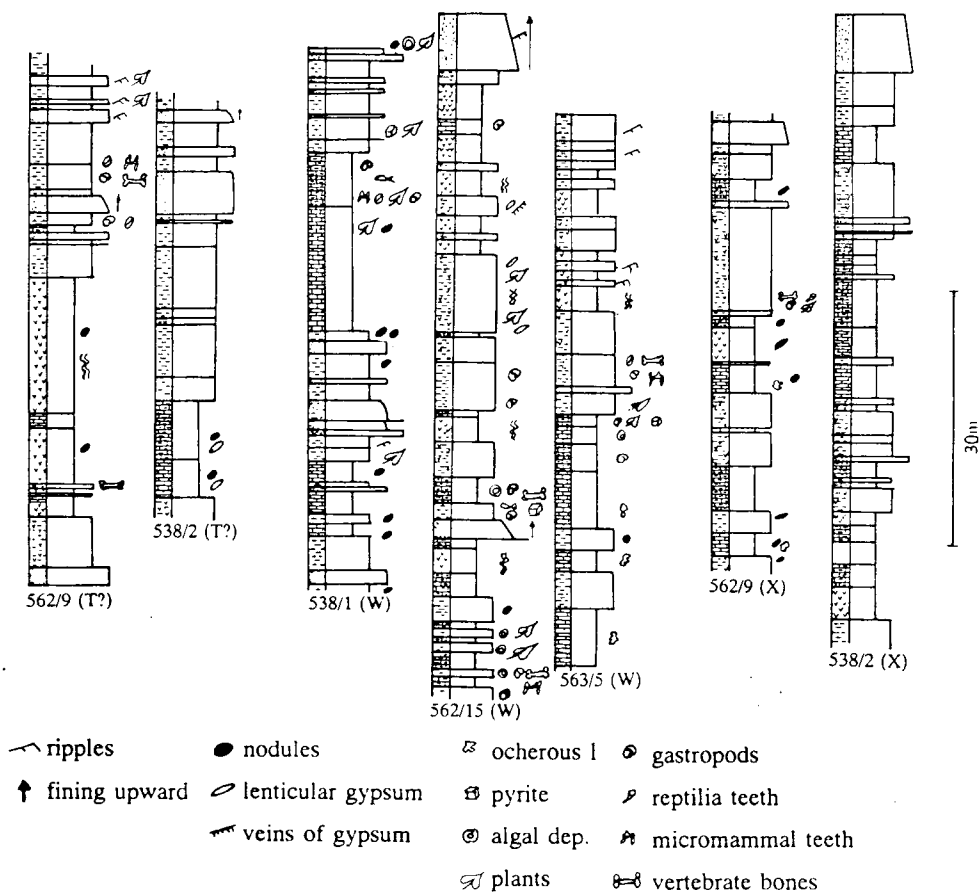


Fig.-6. Some examples of detailed lithological successions of Lower (T?), Middle (W) and Upper (X) palustrine sequences of the Palaeogene unit of the "Depresión Intermedia" Basin.

Sequences ones, because of large amounts of organic matter, pyrite, plan debris etc., have carbonated and/or gypsiferous cement. This unit can be considered well dated (X biozone) not only because borehole data but because field data: a palaeontological site ("Transbordador") placed in the overlying unit (Neogene Unit) is in the Y biozone. This unit rapidly interfinges southwards with channel deposits and quickly it disappears.

Conclusions

Borehole in the "Depresión Intermedia" Basin allowed to interpret the development of a palustrine area in the Arvernian- Lower Agenian, into a shadow energy zone (Córcoles Anticline influence) in a alluvial fan dominated basin.

The determination of a Upper Oligocene chemical deposition permits to understand thick carbonated deposits in the eastern flank of Córcoles anticline) which were misunderstood up to now.

It is possible to determine three minor sedimentary sequences into the chemical complex of the Paleogene Unit; they could be correlated with events (grain size general changes) in the channel deposits at the south of the study zone.

It is necessary to assert that the Paleogene Unit (*sensu* this paper) constitutes a whole Sedimentary Sequence clearly defined at his top by a general sedimentary break which must be correlated with many palaeogeographical events observable in all the basin.

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